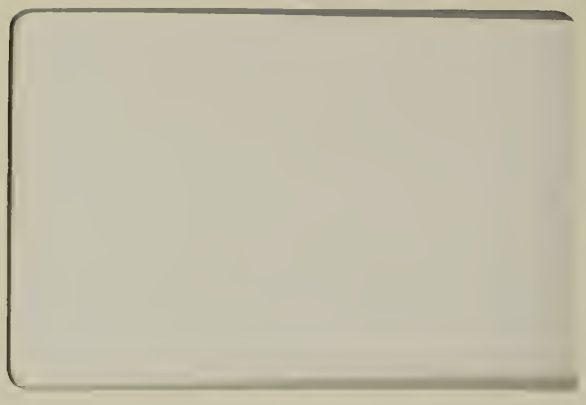
HIGHWAY INFORMATION SYSTEM
VOLUME 1: USER INFORMATION
CHAPTER 1-VIII
ACCIDENT ANALYSIS

Department of Civil Engineering & Engineering Mechanics Montana State University Bozeman



HIGHWAY INFORMATION SYSTEM

VOLUME 1: USER INFORMATION

CHAPTER 1-VIII

ACCIDENT ANALYSIS

Prepared for

THE STATE OF MONTANA
DEPARTMENT OF INTERGOVERNMENTAL RELATIONS
HIGHWAY TRAFFIC SAFETY DIVISION

In cooperation with

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FOREWORD

This chapter is the documentation of a portion of the highway information retrieval system research undertaken by the Department of Civil Engineering and Engineering Mechanics, Montana State University. This portion of the research was sponsored by the Highway Traffic Safety Division, Department of Intergovernmental Relations, State of Montana.

The first seven chapters, for which a Table of Contents is enclosed, serves as the basic documentation of the Highway Information System. That work, sponsored by the Planning and Research Bureau, Department of Highways, State of Montana, is reported in two volumes: Highway Information System Volume 1: User Information, and Highway Information System Volume 2: Programmer Information. Volume 1 deals with the use of the system, including information on data coding and on the execution of programs within the system. Volume 2 deals with the detailed operation of the system, providing information on the modification of programs existing within the system as well as on the addition of programs to the system. Each chapter of volume 1 is a prerequisite publication to the corresponding chapter of volume 2.

In addition to the tremendous amount of assistance furnished by personnel of the Highway Traffic Safety Division, the assistance of personnel of the Planning and Research Bureau and Traffic Design Unit of the Montana Department of Highways is also acknowledged.

Professor Alfred C. Scheer, Dr. Ralph W. Zimmer, Professor Robert C. Smith, and Mr. Philip A. House of Montana State University have collaborated with the authors to bring this portion of the research to a successful conclusion, and their efforts are gratefully acknowledged.

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CHAPTER 1-VIII
ACCIDENT ANALYSIS

Introduction

The accident analysis software described herein is designed to run in conjunction with the Highway Information System (HIS) supervisor routine, and utilizes a number of the HIS data files.

The accident analysis software consists of two packages: 1) a municipal package and 2) a rural package. The municipal package consists of a single HIS command, and provides an analysis of intersections within cities. The rural package consists of two HIS commands, and provides capabilities for locating and "analyzing" accident "clusters" on rural roadways.

Municipal Accident Analysis

The municipal accident analysis package is designed to aid in locating intersections having higher numbers of accidents. The package consists of a single HIS command, which causes an interrogation of the accident file for accidents occurring at intersections within a specified city. Any of the 126 incorporated cities of Montana may be specified.

Accident locations within a city are specified by means of a two-dimensional coordinate system, or "grid." The grid consists of an x-coordinate ranging from 0000 to 2000 and a y-coordinate ranging from 0000 to 1000, overlaid onto a city map. The location of each accident occurring within the city is coded and stored in the HIS accident detail file.

The locations of intersections within a city are entered into the analysis program by means of a "grid file" prepared by the user. The name and the coordinates of each intersection for that city are included in the table.

HIGH-ACC-INTERSECTNS Program -- HIGH-ACC-INTERSECTNS is the program that assigns accidents within the city to the appropriate intersection. The user may select any of three methods of "analysis" for intersections with the specified city: 1) output a summary of accident information for each inter-

section within the city having more accidents than a specified number during a specified time period (#-ACCIDENTS mode); 2) output a summary of accident information for the specified number of intersections in a city having the greatest number of accidents during a specified time period (#-INTERSECTIONS mode); and 3) output a summary of accidents at individual intersections specified by name during the specified time period (individual intersections mode).

In each summary two listings are generated: 1) a list containing information pertaining to details of each accident (event) at that intersection, and 2) a list containing information pertaining to the vehicles and/or pedestrians involved in each of the accidents at that intersection. The items of information in each of the two listings are shown in Table 1-VIII-I.

As mentioned above, the intersection locations within each city are defined through a grid file prepared by the user. Each record of the grid file contains (see Table 1-VIII-II): 1) the x- and y-coordinate of the center of an intersection within the city, and 2) the common name for that intersection (e.g., SIXTH AND ROBERTS). Every intersection in the city that is significant when considering accidents must appear in the grid file. Each entry is keypunched onto a standard 80-column card in the format shown in Table 1-VIII-II. The grid file for each city is loaded into a disk file for future use with the following OS control cards and HIS command:

```
// EXEC HISACCMA
//SYSIN DD *
:BUILD-GRID-TABLE,CITY=cityname,DDNAME=name
/*
//name DD *
     grid file data cards for specified city
/*
```

The city name is chosen from the list in Table 1-VIII-III. The name coded in the DDNAME parameter must match the name coded on the following DD * statement.

A listing of the grid table may be obtained by using the following OS control cards and HIS command:

TABLE 1-VIII-I

DATA ELEMENTS LISTED BY HIGH-ACC-INTERSECTNS

Listing	Items in Listing
Information pertaining to details of each accident (event)	Accident number x-coordinate y-coordinate Date of occurrence Time of occurrence Day of week of occurrence Number of injuries Number of fatalities Number of vehicles Number of pedestrians First harmful event Collision type Junction-related location Weather condition Road condition Light condition Traffic controls
Information pertaining to vehicles/pedestrians involved in the accident	Accident number Vehicle or pedestrian number Driver age Driver sex Driver arrest (yes/no) Contributing circumstance Vision Contributing circumstance Road Contributing circumstance Mechanical (yes/no) Contributing circumstance Possible violation Intent Body style Trailer style Vehicle year Vehicle damage

TABLE 1-VIII-III

CITY NAMES FOR THE LOCATION PARAMETER

ALBERTON
ANACONDA
BAINVILLE
BAKER
BEARCREEK
BELGRADE
BELT
BIG-SANDY
BIG-TIMBER
BILLINGS
BOULDER
BOZEMAN
BRIDGER
BROADUS
BROADVIEW
BROCKTON
BROWNING
BUTTE
CASCADE
CHESTER
CHINOOK
CHOTEAU
CIRCLE
CLYDE-PARK
COLUMBIA-FALLS
COLUMBUS
CONRAD
CULBERTSON
CUT-BANK
DARBY
DEER-LODGE
DENTON
DILLON
DODSON
DRUMMOND
DUTTON
EAST-HELENA
EKALAKA
ENNIS
EUREKA
FAIRFIELD
FAIRVIEW
FLAXVILLE
FORSYTH
FORT-BENTON
FROID
FROMBERG
GERALDINE
GLASGOW
GLENDIVE
GRASSRANGE
GREAT-FALLS
HAMILTON
HARDIN
HARLEM
HARLOWTON
HAVRE
HELENA
HINGHAM
HOBSON
HOT-SPRINGS
HYSHAM
ISMAY
JOLIET
JORDAN
JUDITH-GAP
KALISPELL
KEVIN
LAUREL
LAVINA
LEWISTOWN
LIBBY
LIMA
LIVINGSTON
LODGE-GRASS
MALTA
MANHATTAN
MEDICINE-LAKE
MELSTONE
MILES-CITY
MISSOULA
MOORE
NASHUA
NEIHART
OPHEIM
OUTLOOK
PHILIPSBURG
PLAINS
PLENTYWOOD
PLEVNA
POLSON
POPLAR
RED-LODGE
REXFORD
RICHEY
RONAN
ROUNDUP
RYEGATE
SACO
ST-IGNATIUS
SCOBEY
SHELBY
SHERIDAN
SIDNEY
STANFORD
STEVENSVILLE
SUNBURST
SUPERIOR
TERRY
THOMPSON-FALLS
THREE-FORKS
TOWNSEND
TROY
TWIN-BRIDGES
VALIER
VIRGINIA-CITY
WALKERVILLE
WESTBY
WEST-YELLOWSTONE
WHITEFISH
WHITEHALL
WH-SULPHUR-SPRINGS
WIBAUX
WINIFRED
WINNETT
WOLF-POINT

TABLE 1-VIII-II

FORMAT OF GRID FILE DATA CARDS

Columns	Item	Remarks
1-4	x-coordinate	See note 1 below
5-8	y-coordinate	See note 1 below
9-48	Intersection name	See note 2 below
49-80	Unused columns	

Notes: 1. Each coordinate is coded as a four-digit number with all leading zeroes present.

2. The intersection name is a left-justified, 40-character, verbal description of the intersection.

```
// EXEC HISACCMA
//SYSIN DD *
:LIST-GRID-TABLE
/*
```

HIGH-ACC-INTERSECTNS COMMAND:

```
:HIGH-ACC-INTERSECTNS,CITY=cityname,
: [START-DATE=mm/dd/yy,][END-DATE=mm/dd/yy,]

: [ACCIDENTS= { INTERSECTION } ,][MAX-#-ENTRIES=eeee,]
              { ALL          }

                                  { #-ACCIDENTS=aaa                  }
: SQUARE-SIZE=sss,                { #-INTERSECTIONS=iii              }
                                  { blank with no preceding comma    }
```

The CITY parameter is used to enter the name of the city for which the analysis is being made. Any one of the 126 cities of Montana may be specified, provided that: 1) the accidents occurring within the city are being reported on the coordinate system, and 2) a grid file defining the intersection locations within that city has been prepared and stored as described above. Table 1-VIII-III shows the city names as they must be coded on the command.

The START-DATE and END-DATE parameters are optional and may be utilized to limit the accidents, by date, being considered. When a START-DATE parameter is present, only accidents occurring on or following the specified date are considered. When the END-DATE parameter is present, only accidents occurring on or before the specified date are included. When both START-DATE and END-DATE are present, only accidents occurring on or between the specified dates are considered. When both START-DATE and END-DATE parameters are omitted, all accidents in the file are considered. Each date is coded as a two-digit month, day, and year separated by slashes. For example, November 2, 1983, is coded as 11/02/83.

The ACCIDENTS parameter may be used to limit the analysis scope to intersection and intersection-related accidents (INTERSECTION) or to include all accidents occurring within the city (ALL) during the time period specified.

The MAX-#-ENTRIES parameter specifies the maximum number of entries that are included in the grid file for the specified city. If the grid file contains 500 or fewer entries, the parameter need not be present. If the grid file contains more than 500 entries, the parameter must be present and must indicate a value at least as large as the number of entries in the grid file for that city. If the grid file contains more than the specified MAX-#-ENTRIES (or more than 500 entries if the parameter is not present), the program will be aborted. In the event that this occurs, specify a larger value in the MAX-#-ENTRIES parameter and rerun.

The SQUARE-SIZE parameter defines the size of each square used in assigning the accidents to an intersection. The number specified is the length of an edge of a square in coordinate units. The center of the square is coincident with the coordinates of the intersection. The value coded must range from 1 to 999.

The #-ACCIDENTS parameter is used in #-ACCIDENTS mode to indicate the minimum number of accidents that must occur at an intersection for that intersection to qualify as a reportable intersection. If an intersection is assigned fewer accidents than specified by #-ACCIDENTS, that intersection does not appear in any summaries. If an intersection is assigned a number of accidents equal to or greater than specified by #-ACCIDENTS the accidents assigned to that intersection are summarized. The value coded for #-ACCIDENTS may range from 1 to 999.

The #-INTERSECTIONS parameter is used to specify the number of intersections for which accidents are to be summarized for a city. The intersections involved in the summary are those with the greatest number of accidents assigned to them. For example, if #-INTERSECTIONS is specified as 5, then the five intersections with the greatest number of accidents assigned to them will appear in the summary. The value coded for #-INTERSECTIONS may range from 1 to 999.

A minimum amount of IBM OS/360 Job Control Language (JCL) is required in order to execute HIGH-ACC-INTERSECTNS. Examples of commands and accompanying OS JCL statements follow:

An example of #-ACCIDENTS and accompanying OS JCL is:

```
// EXEC HISACCMA
//SYSIN DD *
:HIGH-ACC-INTERSECTNS,CITY=GREAT-FALLS,START-DATE=01/01/72,
:  END-DATE=06/30/72,ACCIDENTS=INTERSECTION,
:  SQUARE-SIZE=05,#-ACCIDENTS=15
/*
```

An example of #-INTERSECTIONS and accompanying OS JCL is:

```
// EXEC HISACCMA
//SYSIN DD *
:HIGH-ACC-INTERSECTNS,CITY=GREAT-FALLS,
:  ACCIDENTS=ALL,SQUARE-SIZE=05,#-INTERSECTIONS=10
```

An example of the "Individual Intersections" command and accompanying OS JCL is:

```
// EXEC HISACCMA
//INTSECTN DD *
TENTH-AVE-S-&-TWENTY-FIFTH-ST          Individual intersection
SMELTER-AVE-&-FIFTEENTH-ST             names, left-justified
/*                                     and as named in
                                       GRID TABLE.
```

```
//SYSIN DD *
:HIGH-ACC-INTERSECTNS,CITY=GREAT-FALLS,
:  START-DATE=01/01/72,ACCIDENTS=INTERSECTION,
:  SQUARE-SIZE=03
/*
```

A number of error conditions may arise during execution of HIGH-ACC-INTERSECTNS. The error messages generated and their probable causes are shown in Table 1-VIII-IV.

Rural Accident Analysis

The rural accident "analysis" package is designed to aid in locating and analyzing "clusters" of accidents on rural sections of roadways. The package consists of two HIS commands: 1) to locate higher accident locations by scanning highways for accident clusters, and 2) "analyzing" clusters after they are located.

The route number and milepoint of each accident occurring on a rural roadway is stored in the HIS accident detail file. From this information, the software is able to determine the distance between each accident on a route.

RURAL-ACC-CLUSTERS Program -- RURAL-ACC-CLUSTERS "scans" rural highways searching for accident clusters. The user defines to the program what is meant by an accident cluster by specifying a roadway length and a number of accidents. The program scans the specified highway, searching for sections of the given length having at least the given number of accidents. Each time a cluster is found, all of the information in the HIS accident-by-sections directory file pertaining to the accidents in the cluster is printed. The items printed are shown in Table 1-VIII-V.

The program operates by reading the first accident occurring on the specified highway from the accident-by-sections directory file, and then continues reading accidents to a milepoint equal to the milepoint of the first accident plus the distance specified as LENGTH. A check is made to determine whether at least the specified number of accidents was read before reaching this last accident (which is not within the specified roadway length). If the

TABLE 1-VIII-IV

HIGH-ACC-INTERSECTNS ERROR CONDITIONS

Message	Cause
***** ERROR IN PHASE phasename *****	This message is printed whenever an error occurs during execution as an aid to the programmer. The specific error is also printed.
***** INVALID OR MISSING CITY PARAMETER *****	The city name coded in the CITY parameter did not match any of the names in Table 1-VIII-III. The CITY parameter may have been omitted from the command.
***** ERROR IN CODING DATE *****	Either the starting date or the ending date was coded in a format other than mm/dd/yy.
***** ERROR IN #-ACCIDENTS OR #-INTERSECTIONS PARAMETER *****	Either the value coded in the #-ACCIDENTS or in the #-INTERSECTIONS parameter contained non-numeric characters.
***** SQUARE-SIZE HAS ZERO VALUE *****	The SQUARE-SIZE parameter was omitted, or it was specified as a value of either zero or larger than 999.
***** GRID TABLE STORAGE OVERFLOW *****	The grid file contained more records than were specified in the MAX-#-ENTRIES parameter (or more than 500 if the parameter was not coded). Increase the MAX-#-ENTRIES allocation and re-run.
***** INVALID COORDINATES ***** accident number	The x- or y-coordinate field of an accident detail record contained a non-numeric character. The accident in error was not processed.
***** GRID DIRECTORY CONTAINS NO RECORDS *****	No accidents in the HIS data files met the criterion for inclusion in the analysis summaries. Possible causes are 1) an end-date that precedes a start-date, 2) a date range for which no data exists in the files, or 3) a square-size value that is too small.

TABLE 1-VIII-IV (continued)

Message	Cause
***** ACCIDENT accident number DID NOT OCCUR AT AN INTERSECTION DEFINED IN THE GRID TABLE *****	An accident occurring within the specified city and meeting all of the selection criterion specified on the command did not occur within the squares of any of the intersections defined in the grid file. This message is generated only for intersection and intersection-related accidents, and only when processing in #-ACCIDENTS or #-INTERSECTIONS mode.
***** UNKNOWN INTERSECTION intersection name *****	When processing in individual intersection mode, a card was read containing a name not matching any intersection names in the grid file.
***** NO VALID INTERSECTIONS READ *****	When processing in individual intersection mode, no cards were read containing intersection names matching names in the grid file.
***** NO ACCIDENTS OCCURRED AT INTERSECTION intersection name *****	When processing in individual intersection mode, a card was read containing the name of an intersection at which no accidents occurred.
***** NO INTERSECTIONS ASSIGNED SUFFICIENT ACCIDENTS *****	When processing in #-ACCIDENTS mode, there were no intersections having at least the number of accidents specified.
***** GRID TABLE CONTAINS NO ENTRIES FOR SPECIFIED CITY *****	An attempt was made to process a city for which no grid file had been stored on disk by BUILD-GRID-TABLE.

TABLE 1-VIII-V

DATA ELEMENTS LISTED BY RURAL-ACC-CLUSTERS

Item
Route system
Route number
Milepoint
Accident number
Number of fatalities
Number of injuries
Number of roadway lanes
Date of occurrence
Hour of day
First harmful event
Type of collision
Road surface condition

number of accidents occurring within the LENGTH specified is equal to or greater than #-ACCIDENTS, a listing is printed for that section of roadway. The program then moves to the second accident on the roadway, and repeats the "look-ahead" from that point. Each time a cluster is found, a listing is printed.

RURAL-ACC-CLUSTERS COMMAND:

```
:RURAL-ACC-CLUSTERS,LENGTH=nn.nn,#-ACCIDENTS=aaa,
:  [START-DATE=mm/dd/yy,][END-DATE=mm/dd/yy,]
:  [MAX-#-ACCIDENTS=aaaa,]

:        DATA= { ALL
                 INT
                 PRIM
                 SEC
                 INT=r
                 PRIM=r
                 SEC=r
                 INT=r-r
                 PRIM=r-r
                 SEC=r-r }
      STARTKEY=startkey,ENDKEY=endkey
```

The LENGTH parameter defines roadway length in which a cluster must occur. The length is specified in miles, and must contain leading zeroes and a decimal point to conform to the format nn.nn. For example, a length of one-half-mile is coded as 00.50.

The #-ACCIDENTS parameter defines the minimum number of accidents occurring within the specified roadway length that will qualify the accidents in that roadway length to be classified as a "cluster." The value of the number of accidents coded may range from 1 to 999 (leading zeroes are not required).

The START-DATE and END-DATE parameters are optional and may be used to limit the accidents, by date, being considered. When a START-DATE parameter is present, only accidents occurring on or following the specified date are considered. When the END-DATE parameter is present, only accidents occurring on or before that date are considered. When both START-DATE and END-DATE are present, only accidents occurring on or between the specified dates are considered. When both START-DATE and END-DATE parameters are omitted, all accidents in the file are considered. Each date is coded as a two-digit month, day, and year separated by slashes. For example, January 21, 1972, is coded as 01/21/72.

The MAX-#-ACCIDENTS parameter may be used to indicate the maximum number of accidents that will occur within any highway section of the length specified in the LENGTH parameter. If a section is encountered having more than this number of accidents, the program will be aborted. Should this occur, code a larger value in the MAX-#-ACCIDENTS parameter, and rerun. If the maximum number of accidents that will occur in any roadway section will be 30 or less, the MAX-#-ACCIDENTS parameter need not be present.

The DATA parameter is used to indicate the route or routes being scanned. If the system code is followed by a single route number, only that route is scanned. If the system code is followed by two route numbers separated by a hyphen, those routes and all routes between are scanned (the second route number must have a larger number than the first). Examples of valid DATA parameters are DATA=INT, DATA=PRIM=3-8, and DATA=SEC=209. The DATA parameter provides a simple method of specifying highways under consideration when one or more entire highways are being processed. However, when it is desired that only a portion of a route be processed, a finer specification procedure is required. The beginning and ending "key," each consisting of the route system, route number, and milepoint on a route, are specified as the STARTKEY and ENDKEY parameters.

A minimum amount of IBM OS/360 Job Control Language (JCL) is required in order to execute RURAL-ACC-CLUSTERS. Examples of commands and accompanying OS JCL statements follow:

```
// EXEC HISACCA
//SYSIN DD *
:RURAL-ACC-CLUSTERS,LENGTH=00.75,#-ACCIDENTS=5,
:  START-DATE=01/01/72,END-DATE=12/31/72,
:  DATA=PRIM=3-14
/*


// EXEC HISACCA
//SYSIN DD *
:RURAL-ACC-CLUSTERS,LENGTH=05.00,#-ACCIDENTS=10,
:  MAX-#-ACCIDENTS=50,DATA=PRIM
/*


// EXEC HISACCA
//SYSIN DD *
:RURAL-ACC-CLUSTERS,LENGTH=00.50,#-ACCIDENTS=3,
:  START-DATE=01/31/72,STARTKEY=P005042+0.000,
:  ENDKEY=P005059+0.000
/*


// EXEC HISACCA
//SYSIN DD *
:RURAL-ACC-CLUSTERS,LENGTH=00.50,#-ACCIDENTS=10,DATA=ALL
/*
```

A number of error conditions may arise during the execution of RURAL-ACC-CLUSTERS. The error messages generated and their probable causes are shown in Table 1-VIII-VI.

RURAL-ACC-ANALYSIS Program -- RURAL-ACC-ANALYSIS is designed to "analyze" accident clusters. The analysis consists of a summary of all accidents occurring between two specified milepoints on any roadway. The accident summary information is supplied in three parts: 1) a plot of the accidents and the physical descriptions between the two milepoints on the roadway (the user must realize that regardless of the distance between the specified milepoints, the plot will be scaled to fit on one page), 2) the average daily traffic and

TABLE 1-VIII-VI

RURAL-ACC-CLUSTERS ERROR CONDITIONS

***** KEY ERROR IN TRUMILE FILE. KEY=key *****	An accident in the file specified a route system or route number that does not exist.
***** END OF FILE ENCOUNTERED FOR ACCIDENT DIRECTORY *****	This message will always be printed after processing the last route for which there is data in the file.
***** STARTKEY IS GREATER THAN ENDKEY *****	The key coded in the STARTKEY parameter was greater than that specified in the ENDKEY parameter.
***** STARTKEY OR ENDKEY MISSING *****	Either the STARTKEY parameter or the ENDKEY parameter or both (or the DATA parameter) was missing.
***** INVALID START-DATE OR END-DATE *****	Either the START-DATE or the END-DATE parameter contained a date in a form other than mm/dd/yy.
***** MISSING #-ACCIDENTS OR LENGTH *****	Either the #-ACCIDENTS or the LENGTH parameter was omitted from the command.
***** STORAGE OVERFLOW *****	At least one of the roadway sections contained more than the number of accidents specified by MAX-#-ACCIDENTS (or more than 30 if the parameter was not coded). Increase the MAX-#-ACCIDENTS allocation and rerun.

accident rate between the two milepoints on the roadway, and 3) a summary describing the accident and vehicle details for each accident occurring on the specified section of roadway. Table 1-VIII-VII lists the accident and vehicle details that are summarized.

RURAL-ACC-ANALYSIS COMMAND:

```
:RURAL-ACC-ANALYSIS,STARTKEY=startkey,
:  ENDKEY=endkey,[START-DATE=mm/dd/yy,]
:  [END-DATE=mm/dd/yy]
```

The STARTKEY, ENDKEY, START-DATE, and END-DATE parameters are as defined under RURAL-ACC-CLUSTERS COMMAND above.

A minimum amount of IBM OS/360 Job Control Language (JCL) is required in order to execute RURAL-ACC-ANALYSIS. Examples of commands and accompanying OS JCL statements follow:

```
// EXEC HISACCA
//SYSIN DD *
:RURAL-ACC-ANALYSIS,STARTKEY=P001032+1.680,
:  ENDKEY=P001033+0.900,START-DATE=01/01/72,
:  END-DATE=08/01/72
/*
```

```
// EXEC HISACCA
//SYSIN DD *
:RURAL-ACC-ANALYSIS,STARTKEY=P005042+0.000,
:  ENDKEY=P005052+0.200
/*
```

A number of error conditions may arise during the execution of RURAL-ACC-ANALYSIS. The error messages generated and their probable causes are shown in Table 1-VIII-VIII.

TABLE 1-VIII-VII

ACCIDENT AND VEHICLE DETAILS SUMMARIZED BY RURAL-ACC-ANALYSIS

---------- Accident Details ----------

Accident milepoint
Accident number
Time of occurrence
Date of occurrence
Day of week of occurrence
Class of trafficway
Junction-related location
Roadway-related location
Was an engineering study requested or not
First harmful event
First object hit
Weather condition
Road Condition
Light condition
Traffic controls
Collision type
Injury severity

---------- Vehicle Details ----------

Accident number
Vehicle or pedestrian number
Driver age
Driver sex
Driver arrest (yes/no)
Contributing circumstance Vision
Contributing circumstance Road
Contributing circumstance Mechanical (yes/no)
Contributing circumstance Possible violation
Intent
Body style
Trailer
Vehicle year
Vehicle damage

TABLE 1-VIII-VIII

RURAL-ACC-ANALYSIS ERROR CONDITIONS

Message	Cause
***** ERROR IN PHASE phasename *****	This message is printed whenever an error occurs during execution as an aid to the programmer. The specific error is also printed.
***** STARTKEY IS GREATER THAN ENDKEY *****	The key coded in the STARTKEY parameter was greater than that specified in the ENDKEY parameter.
***** STARTKEY OR ENDKEY MISSING *****	Either the STARTKEY parameter or the ENDKEY parameter or both were missing.
***** STARTKEY AND ENDKEY DO NOT OCCUR ON THE SAME ROUTE *****	The STARTKEY parameter and ENDKEY parameter must contain the same route number.
***** INVALID START-DATE OR END-DATE *****	Either the START-DATE or the END-DATE parameter contained a date in a form other than mm/dd/yy.
***** STORAGE OVERFLOW *****	More accidents have occurred on the section of highway being analyzed than can be stored within the program. The length of the highway section must be shortened to reduce the storage requirements.
***** STARTKEY OR ENDKEY FALL WITHIN A COINCIDENT OR PRESENT TRAVELED WAY (PTW) *****	The section of highway being analyzed is coincident with or on the present traveled way (PTW) of a higher priority route. The STARTKEY parameter and the ENDKEY parameter must be on the highest priority route.